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# A United States Antisatellite Policy for a Multipolar World

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## *Abstract*

Whether to pursue the continued development of a United States antisatellite in the 1990s will prove a difficult choice for defense planners. Making a case for the weapon system in the bipolar world seems "intuitively obvious" to ASAT advocates. The US was faced with a formidable foe possessing weapons in superior numbers in many categories. The Soviet Union also recognized the "force-multiplier" effect space systems had for its forces made the Soviet Union appear an even more formidable enemy. Pursuing a US ASAT in that era appeared to many a logical, necessary choice to negate such advantages. Responding to the perceived threat, the Eisenhower, Kennedy, and Carter administrations chose a "two-track" policy for the US ASAT program—arms control and ASAT research and development short of actual deployment. The Reagan and Bush administrations chose a different policy, opting for outright deployment convinced that verifiable arms controls on ASATs were unachievable and Soviet space systems must not be allowed to operate in sanctuary. Fearing an escalation of the arms race to space, Congress, in large part, has thwarted the plans of these administrations with ASAT testing bans and reduced funding.

A new ASAT policy seems appropriate as the US faces an entirely new, but uncertain, threat with the disintegration of the Soviet Union and the rise of a multipolar world. Analyzing the ASAT debate from the past and the dynamics of the emerging space environment and threat can help in formulating that new ASAT policy—a continued ASAT research and development program, short of production and deployment, and arms control combined with collective security to diminish threat uncertainty. As the US reduces defense spending and force structure, such a policy would serve the national interests of the United States as the multipolar world develops.

## *About the Author*

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## Chapter 1

# Setting the Stage

Should the US develop and deploy an antisatellite (ASAT) system in the post-cold war era? Over the past 30 years two opposing groups presented arguments for and against the development and deployment of a US ASAT. The proponents' primary rationale for a US ASAT program was to deter Soviet aggression in space and counter the threat from Soviet space assets.[1] The opponents presented a spectrum of arguments against such a weapon system. They characterized ASATs as being destabilizing and argued that the US had more to lose in an ASAT war (i. e., the US was more dependent on its space assets than the Soviets).

Given the recent and rapid changes in the Soviet threat, the expected decline in the US defense budget, the increasing public pressure to cut defense spending, and the anticipated US military force reductions, justifying a US ASAT will undoubtedly prove even more difficult in the future than it has been in the past. In this environment US ASAT proponents may find the arguments for their weapon system even less appealing to their opponents than they ever have been. Both sides may have even greater difficulty in agreeing on a defense policy for the US ASAT program. The spread of space technology to third world nations and the uncertainty of a multipolar world is likely to generate a new round of debates between the proponents and opponents of ASAT. While understanding ASAT's past debate and appreciating today's defense planning environment, this report formulates an ASAT policy for the developing multipolar world which satisfies the concerns of ASAT proponents and opponents alike.

## ASAT's Past Arguments—For and Against

For nearly three decades the United States and the Soviet Union have been the world's primary civil and military users of space. During this period technology has advanced to the point that military space systems have become more important to these nations in the protection of each one's respective national interests. Military space systems provide and relay important and diverse information on each side's forces. These systems provide communications, weather monitoring, navigation, warning, reconnaissance, and intelligence data and functions. Military space systems have become important and, perhaps, critical assets for managing the deployment

and employment of military forces on land, at sea, and in the air. It is conceivable they could be used in any and every conflict ranging from the lowest intensity to nuclear war. Many commanders think of space systems today as true "force-multipliers." Because of their growing importance in the utility they provide earthbound forces, space systems have become lucrative targets for opposing military forces.

In the past, the two opposing sides offered differing philosophies over US space policy vis-á-vis military space systems and ASATs. One side contended that space was just an extension of the earthbound environment and assets deployed there would have to adapt to potential threats with appropriate countermeasures just as forces deployed on the earth's surface had to adapt. Advocates of this position believed the US should act to provide the capability to deny the Soviet's use of space while at the same time ensuring its use by the US. Furthermore, proponents of this position insisted that developing ASAT systems was a logical step to ensure the protection of forces on the ground from the prying sensors of enemy intelligence gathering and reconnaissance satellites. Drawing a parallel with the denial of reconnaissance plane overflights by surface-to-air missiles, advocates argued an ASAT would perform a similar function, only it would perform that function against targets in space as opposed to the air.[2] Moreover, they asserted, it was infeasible to constrain ASATs since many other systems (e.g., intercontinental ballistic missiles [ICBMs], antiballistic missiles [ABM], and laser test facilities) had inherent ASAT capabilities which would prove impossible to monitor and limit under any treaty provisions.

Given the increasing importance of military satellites (MILSATs) to both the Soviet Union and the United States, an opposite view held that such a nonchalant approach to antisatellites, as "just another weapon system" in just another medium (space), was reckless and irresponsible. This viewpoint asserted that the US was even more dependent on MILSATs than the Soviets and, therefore, had more to lose in a "satellite war" between the two countries. They believed the development and deployment of a sophisticated US ASAT would be destabilizing and likely to result in another arms race, only this time in space. This side of the ASAT debate believed that such a weapon, capable of holding at risk the opposing nation's critical warning and strategic communications satellites, might increase the incentive for one side to strike first in a crisis situation. Furthermore, the opponents to the US ASAT program felt the US would be better served by competing with the Soviet's broadly in space systems, not just in a tit-for-tat ASAT contest. In other words, engaging in an arms race by *matching* the Soviets, ASAT capability for ASAT capability, was counterproductive. Rather, *countering* the Soviets' ASAT capabilities and taking advantage of our technological prowess, this side believed, was the more prudent path for utilizing space and avoiding a situation in which the US was bound to lose more than it could gain. Ultimately, this group desired both sides to negotiate a treaty to ban ASAT development and any further testing of the weapons in space.

Despite the efforts of those who would rather the Soviet Union and the United States negotiate a ban on ASATs, both nations worked on ASAT programs since the early 1960s. Both the United States and the Soviet Union fielded an operational ASAT. The only operational ASAT the US deployed was deactivated in the mid-1970s. However, the Department of Defense believes the Soviet Union's ASAT is still operational, even though it has not been tested since 1982. For a period during the mid-1980s, the US Congress constrained testing of another US ASAT program. The Department of Defense (DOD) eventually canceled that particular program. Congress lifted its constraints against US ASAT testing after the program was canceled and authorized the startup of another US ASAT system in the late 1980s. With the Soviet Union's ASAT purportedly still operational and the US embarking on another phase in its ASAT program, it would appear the Soviet Union and the US still saw some virtue in having an operational ASAT.

## ASAT's Arguments—Today and Tomorrow

What is the virtue in pursuing an operational ASAT for the US now that the former Soviet Union no longer exists as we once knew it? Does the US still consider the space assets of the Soviet Union a threat while both nations race to slash nuclear arms? What is the future space threat that would warrant the absolute necessity of a US ASAT program to counter that threat? Given the anticipated defense budget cuts and declining force structures of the future, what impacts on the development and deployment of other surface forces or space systems would the US be willing to absorb in order to fund the development and deployment of an ASAT system?

These are some very difficult questions the DOD and Congress will have to soon address in deciding the future of the US ASAT program along with a myriad of other defense programs. In the past members of Congress and the military expressed honest differences of opinion over the efficacy of ASAT. As the DOD and Congress debate defense policy and the concomitant force structure for the 1990s, reflecting on ASAT's past should provide significant insight into charting ASAT's policy for the future. Indeed, it is the purpose of this paper to review the past arguments advanced both for and against a US ASAT and to suggest a policy for the near future which addresses the uncertainty of the developing multipolar world and its emerging space powers.

In subsequent chapters the reader will find the reasons for the early development of an ASAT and the policy adopted by the governing administration. Chapter three discusses the early years of the US ASAT program and the Eisenhower administration's seminal policies for its development. Chapter four traces the evolution and sophistication of the ASAT program debate during the Carter and Reagan administrations. Chapter five presents the ASAT program debate during the transitional period between the Reagan and Bush administrations which was probably

one of the more controversial periods for ASAT. Chapter six discusses the possible evolution of the ASAT debate for a multipolar world. And, chapter seven examines the dynamics of the emerging space threat, suggests an ASAT policy for the 1990s as a counter, and analyzes that policy against those advanced in the past.

However, before presenting any of the arguments or history of the US ASAT program, it is important for the reader to understand the context of the role and value that military space systems provide in today's environment. Without military space systems there would, of course, be no requirement for any nation to field an ASAT. Military space systems are the ASAT's raison d'etre. Appreciating the roles and values these systems provide to surface forces provides an understanding for the tension that has developed and grown over the past between those who argue for and against a US ASAT.

**Notes**

1. "Fact Sheet Outlining United States Space Policy, 4 July 1982," *Public Papers of the Presidents of the United States: Ronald Reagan, 1982* (Washington, D.C:, Government Printing Office 1983), bk. 2, 897.

2. Gen John L. Piotrowski, "Why the U.S. Needs an Antisatellite," *National Defense*, February 1990, 37.

## Chapter 2

# Considering the Role and Value of Military Satellites

In the latter years of his presidency, Lyndon B. Johnson looked back on the Cuban missile crisis and noted "if nothing else has come of it [the US space program] except the knowledge we've gained from space photography it would be worth ten times what the whole program cost."[1] Even in the early 1960s the national authorities were apparently beginning to appreciate the value of space systems for observing the forces of another nation—observation that might otherwise be denied by other means. President Johnson's statement could be thought somewhat prescient if one considers the growth into space the US and the Soviet Union experienced since that crisis between the two nations nearly 30 years ago.

Today space systems for the US and the former USSR have taken on important roles in providing data and performing functions for each side's militaries. The US Air Force acknowledges the importance space systems play in augmenting the capabilities of US surface forces in the Air Force's Military Space Doctrine: "To achieve their full potential, space systems and operations must be fully integrated within existing military forces to become part of the total force structure."[2] The systems and operations the doctrine refers to include, but are not limited to, weather, communications, navigation, and surveillance.

Weather information and precise navigational data are essential for the conduct of effective military operations. During the Vietnam War, weather satellites proved for the first time their advantage over other means for weather monitoring and forecasting.[3] Providing his opinion on the importance of space derived weather information, Gen William Momyer remarked:

> As far as I'm concerned, this weather picture is probably the greatest innovation of the war. I depend on it in conjunction with the traditional forecast as a basic means of making my decisions as to whether to launch or not to launch a strike. . . . The [DMSP] satellite is something no commander has ever had before in a war.[4]

Without Defense Meteorological Satellite Program (DMSP) weather capabilities, how many strikes would General Momyer have delayed or canceled? If General Momyer knew his adversary had a similar capability like DMSP, would he have wanted to deny him that resource to complicate his military planning activities?

Weather is not the only function being provided by space forces to military commanders. One military publication states "satellite communication

(SATCOM) systems carry a large portion of intertheater and intercontinental DOD traffic and a significant portion of intratheater or tactical communications . . . [and] provide the most effective means for naval communications (except for line-of-sight traffic)."[5] The US Navy may be one of the bigger users of satellite communications capabilities since its oceangoing fleets are not capable of using land or undersea cables for relaying traffic. One military journal estimates the US Navy relies on satellites for relaying 95 percent of its messages.[6] In 1984 Vice Adm Gordon Nagler estimated the Navy was depending on satellites to relay 85 percent of its communications.[7] Commenting on the criticality of satellite communications to US forces during the Grenada operation, Adm Wesley McDonald stated: "Satellite communications were used in most cases all the way from the company level to the JCS . . . I don't think I will surprise anyone when I say that in this type of operation, satellite connectivity is absolutely essential."[8] More recently, military satellite communications systems demonstrated their value in the Persian Gulf conflict. Gen Donald J. Kutyna, testifying before the Senate Armed Services Committee, remarked:

> Effective command and control of US and coalition forces simply would have been impossible without military satellite communication systems. Over ninety percent of communications to and from the area of operations were carried over satellite systems, and thousands of satellite communications receivers were used in theater down to the unit level. The lack of a viable communications infrastructure in many areas of Saudi Arabia and Kuwait also increased our dependence on satellite systems for intratheater command and control.[9]

In addition to weather and communications, military space systems provide precise navigation and timing data to surface forces. Even though the US Global Positioning System (GPS) has not quite reached the full deployment of its entire constellation, it proved vital to the success of Desert Storm operations. Coalition forces used GPS extensively to navigate in the featureless terrain of Kuwaiti theater of operations and generate precise bombing and artillery fire support. General Kutyna remarked that the "[GPS] system in combat proved an unqualified success . . . the lessons learned during Desert Storm will further increase our ability to exploit this valuable hardware."[10] Had the US and coalition forces not had the use of GPS during Desert Storm operations, they could have used other sources for generating position and timing data. However, the accuracy of that timing and position data would not have been as precise as that provided by the GPS system. One can only speculate how the lack of GPS data in Desert Storm would have affected coalition operations.

Finally, a number of reconnaissance and surveillance platforms, operating at various altitudes and orbits, provide a means for detecting and characterizing other nations' weapons systems during peacetime. Intelligence data collection at the strategic level during peacetime is normally a benign operation conducted without wartime tension. Ashton Carter asserts that one would logically desire to use these surveillance capabilities for wartime purposes too, such as "tracking fleet movements, locating rear area targets,

sorting out enemy lines of supply and command, monitoring activities at airbases, intercepting communications, warning of enemy advances and so on."[11] For example, Jane's Information Group asserted allied commanders used visible, infrared, radar, and electronic information gathered from electronic intelligence (ELINT) and imaging satellites during the Persian Gulf conflict to assess Iraqi capabilities and determine battle damage assessment.[12] Gen John A. Wickham stated allied forces used overhead capabilities to perform battle damage assessment and discern Iraqi deception ploys for faking battle damage from real damage.[13] Clearly, reconnaissance and surveillance capabilities can serve a commander in wartime as well as peacetime.

The USSR, like the US, has acknowledged the importance of space systems to its own surface forces. According to Nicholas Johnson, a chief scientist for Teledyne Brown Engineering and a consultant to United States Space Command on Soviet space forces, the USSR conceded in 1985 that satellites performing force enhancement functions or serving as verification tools for arms control treaties "represent legitimate uses of Earth-orbiting satellites."[14] The Soviets have disclosed that 3.9 billion rubles were spent annually on its military space programs.[15] The Soviets, whose standard of living does not come anywhere near that of the Western World, justified such a large amount of money on its military space programs because "implementation of space programs for military purposes will enhance the combat effectiveness of our Armed Forces by a factor of 1.5-2."[16]

Like the US, the Soviet Union also has very capable space communications systems, meteorological satellites, a Soviet version of GPS, as well as reconnaissance and surveillance platforms. And just like the US, the Soviet space systems over the past three decades became probably just as integral to its weapons and targeting systems, giving them the claimed improvement in combat effectiveness of "1.5-2."

Why would the US allow a space system, which might be performing a benign function in peacetime, but a hostile one in crisis or war, to operate in a sanctuary? For a number of years the US operated in such an environment as the Soviets fielded and improved their space systems for monitoring and targeting US and allied surface forces. The former Soviet Union apparently recognized the importance of our space systems to us for performing the same function and did field an ASAT system as a counter. This question becomes even more difficult if we include the increasing number of space-faring nations who are only beginning to develop and deploy benign space systems for peaceful purposes.

Space systems did not achieve overnight the importance that many have attached to them today. In the 1950s and 1960s space systems were not as proliferated nor as capable as today's modern space systems. Indeed, one may argue space systems of that era were "oddities" and provided to national leaders and military commanders at best a secondary or tertiary means for reconnaissance, communications, or other functions. Nevertheless, those leaders and commanders began to anticipate how important those systems might become—and began to think of ways in which they might be negated.

## Notes

1. From *New York Times,* 17 March 1967. Quoted in Nicholas L. Johnson, *Soviet Military Strategy in Space* (London: Jane's Publishing Co., Ltd., 1987), 56.
2. AFM 1–6, *Military Space Doctrine,* 15 October 1982, 5.
3. Henry W. Brandli, "The Use of Meteorological Satellites in Southeast Asia Operations," *Aerospace Historian,* vol. 29 (September 1982): 172–75.
4. Charles C. Bates and John F. Fuller, *America's Weather Warriors* (College Station, Tex.: Texas A&M University Press, 1986), 193.
5. Majs Steve Malutich and Bruce Thieman, "Space Systems for Military Use," in *Space: The Fourth Military Arena* (Maxwell AFB, Ala.: Air Command and Staff College, 1991), 80.
6. L. Edgar Prina, "Signal Flags to Satellites," *Sea Power* (December 1983), 45.
7. Quoted in "Space: Air Force and Navy Outlook," *Signal* (January 1984), 24.
8. Adm Wesley McDonald Reviews $C^3I$ during Grenada Operation," *Aerospace Daily,* 16 December 1983, 23.
9. Quoted in Gen Donald J. Kutyna, "The Military Space Program and Desert Storm," *Space Times* (September–October 1991), 4.
10. Ibid., 5.
11. Ashton Carter, "Satellites and Anti-Satellites: The Limits of the Possible," *International Security* (Spring 1986), 60.
12. Andrew Wilson, ed., *Interavia Space Flight Directory 1991–92* (London: Jane's Information Group, 1991), 215.
13. Gen John A. Wickham, Jr., "The Intelligence Role in Desert Storm," *Signal* (April 1991), 12.
14. Nicholas L. Johnson, *The Soviet Year in Space 1990* (Colorado Springs, Colo.: Teledyne Brown Engineering, 1991), 81.
15. From *Izvestiya*, Moscow, 8 June 1989, 1–3..
16. From *Pravda*, Moscow, 11 June 1989, 5; and *Krasnaya Zvezda*, Moscow, 29 July 1989, 3. Also quoted in Johnson's *Soviet Year in Space 1990,* 81.

## Chapter 3

# ASAT's Genesis
## *The Arguments Begin*

*You do not have 50 and 100 megaton bombs. We have bombs stronger than 100 megatons. We placed Gagarin and Titov in space and we can replace them with other loads that can be directed to any place on earth.*

Nikita Khrushchev

The Soviet launch of Sputnik and other bellicose statements by the Soviet leadership prompted a dramatic rise in the number of speeches calling for a vigorous US space program. The US Air Force in turn commissioned in 1961 its first 10-year space plan. Completed in September, the plan called for a number of initiatives including the urgent development of a satellite interception system which had already been under study.[1] Not to be left out, the US Army and US Navy developed their own space initiatives including antisatellite concepts. The services began a number of investigatory space projects in the second half of the Dwight D. Eisenhower administration, but before any of them could be brought to a developmental, production, or deployment phase they had to meet the test of Eisenhower administration policies. This chapter reviews the Eisenhower administration's space policies vis-á-vis antisatellites and the US Air Force's early antisatellite project of the 1960s. The incipient arguments and justifications offered for and against the "weaponization of space" during this period are presented as the foundation upon which the antisatellite controversy was born and has grown to this day.

## Early Arguments for ASAT

As the space age began, the military services began to voice their requirements for space control. In a speech on 29 November 1957, Air Force chief of staff Gen Thomas D. White said he "[felt] that in the future whoever has the capability to control space will likewise possess the capability to exert control of the surface of the earth."[2] The Army recognized with the Air Force the military potential of space. In his book *War and Peace in the Space Age* Army Gen James Gavin stated:

> It is inconceivable to me that we would indefinitely tolerate Soviet reconnaissance of the United States without protest, for clearly such reconnaissance has an association with an ICBM program. It is necessary, therefore, and I believe urgently

necessary, that we acquire at least a capability of denying Soviet overflight—that we develop a satellite interceptor.[3]

White and Gavin were not alone in their sentiments. At least one US Senator expressed the same concern for a Soviet capability to spy on the US and its forces. Senator Keating declared in 1959 that if the Soviet Union put a satellite in orbit "for the purpose of viewing what was going on [in] this country we should try to shoot it down and any other country would [sic]."[4] The US Army was so concerned about Soviet intentions and potential capabilities that in June 1957 General Gavin directed the Redstone complex at Huntsville, Alabama to investigate the feasibility of satellite interceptors to deny the Soviet use of any space reconnaissance capability. Consequently, the Army had developed by 19 November 1957 several space program recommendations, which stated inter alia "sooner or later, in the interest of survival, the United States will have to be able to defend itself against satellite intrusion, otherwise it will be helpless before any aggressor equipped with armed reconnaissance satellites."[5] A potential threat had been identified; a means to negate that threat was now required.

## Eisenhower Administration Hedges Its Bets

To allow itself the widest latitude of possible courses of action while it developed its space policy, the Eisenhower administration allowed the three services and the Advanced Research Projects Agency (ARPA) to pursue various space weapon projects, but to a level no further than preliminary conceptual development. At a meeting of the National Security Council (NSC) on 13 February 1958, the administration discussed the goals for such military programs. Several days later the administration established the results of that meeting in NSC 5802/1, a document entitled "U.S. Policy on Continental Defense." The document listed "Defense Against Satellites and Space Vehicles" as an area of "particular importance" where a "vigorous research and development program should be maintained in order to develop new weapons and needed improvements in the continental defense system and to counter improving Soviet technological capabilities for attack against the United States."[6] It would appear then that the administration had some concern over the threatening potential of space systems hinted at by Nikita Khrushchev. Nevertheless, the Eisenhower administration resisted US military service pressure to deploy any robust capability to negate any potential Soviet reconnaissance satellites or space weapon systems for a number of reasons.

## Resisting ASAT

First, the Eisenhower administration held little regard for any potential threat the Soviets might develop in reconnaissance satellites or orbital

bombardment systems. At the request of President Eisenhower in 1958, Edward Purcell led a special panel of the Presidential Science Advisory Committee (PSAC) to recommend the outlines of a national space program. The report, endorsed by Eisenhower on 26 March 1958, emphasized the beneficial aspects of the scientific use of space as opposed to its "militarization." It did include an optimistic discussion of a number of potential "passive" military uses of space, such as weather forecasting, reconnaissance, and communication. Notably, however, the report stated: "Much has been written about space as a future theater of war, raising such suggestions of satellite bombers, military bases on the moon and so on. For the most part, even the more sober proposals do not hold up well. . . . In short, the earth would appear to be after all, the best weapons carrier."[7] Author Paul Stares believed "the [Purcell] report's endorsement of the passive military benefits of space and its unequivocal rejection of the utility of space weapons established the basic guidelines of the US military exploitation of space."[8] Following the Purcell report, NSC 5814/1, while recognizing the potential of Soviet satellite capabilities to provide some military capabilities, stated the "development of a weapon system to counter Soviet satellite reconnaissance offered marginal benefits to the United States, especially as the Soviet Union could gain virtually all the information that satellites provided from open US sources."[9] Within the Defense Department itself there seemed to be a difference of opinion over the requirement for a satellite interceptor. In spite of the views previously expressed by Generals White and Gavin, on 23 May 1960, Deputy Secretary of Defense James Douglas stated:

> The Defense position is that there is no urgent requirement for a capability to intercept satellites. There is no clear indication that the Soviets are expending effort on reconnaissance satellites or on weapon-carrying satellites. Such reconnaissance would seem to offer little attraction to them, and the utility of an offensive satellite weapon in the near future is very questionable.[10]

Secondly, the Eisenhower administration doubted the utility of the space weapon (meaning orbiting bomb) itself. As the Purcell report indicated, land-based systems such as intermediate range ballistic missile (IRBMs) and intercontinental ballistic missile (ICBMs) would be superior to an orbiting bombardment system. Therefore, logic dictated the Soviets should eventually arrive at the same conclusion, obviating the need for the US to develop an antisatellite to negate any Soviet orbiting bombardment system.

Ironically, the expected growth and use of the US reconnaissance satellites was the most compelling reason the Eisenhower administration used in checking its own military services' desire to weaponize space. NSC 5814/1 stated: "Reconnaissance satellites are of critical importance to U.S. national security."[11] Supposedly the differences in the societies of the US and USSR made the satellites more critical to US national security. Paul Stares offered the opinion that "[g]iven the closed nature of Soviet society, reconnais- sance satellites were seen to have greater value to the United States than the Soviet Union."[12] If US reconnaissance satellites were to actually become of greater value to US national security than the USSR, then logically the USSR, not

the US, would have the greater incentive to develop antisatellite weapons. Indeed, Herbert York, who at one time was Director, Defense Research and Engineering (DDR&E), remarked, "The President himself, in recognition of the fact that we didn't want anybody else interfering with our satellites, limited [one ASAT] program to study only status and ordered that no publicity be given either the idea or the study of it."[13] Another former Defense Department official seemed to confirm President Eisenhower's position: "He (President Eisenhower) was opposed to antisatellites because he felt that satellites were more to our benefit than to the Soviets and he did not want us to do anything that would initiate antisatellite warfare."[14] Much of Eisenhower's position on the military use of space was captured in NSC 5814/1, whose policy guidance section stated the US should "[i]n anticipation of the availability of reconnaissance satellites, seek urgently a political framework which will place the uses of US reconnaissance satellites in a political and psychological context most favorable to the United States."[15] In other words, the Eisenhower administration would rather preserve the "peaceful" use of space and was willing to use arms control negotiations to do so. Where "passive" military uses of space were concerned (for example, weather forecasting, communications, reconnaissance), the Eisenhower administration preferred to adopt a "sanctuary" doctrine given the assumption that our satellites would eventually be more useful to us than Soviet satellites would be to the USSR.

The two NSC documents, NSC 5802/1 and NSC 5814/1, greatly affected Eisenhower administration space policy—and ASAT development. While seeking to develop the peaceful use of space, the Eisenhower administration was willing to "hedge its bets" by at least pursuing ASAT conceptual development in case the Soviets proved uncooperative. At the end of its tenure, the Eisenhower administration was given cause by the antisatellite proponents to give more vigorous consideration to a satellite negation capability.

## The Rise of the Satellite Interceptor

The cause was a rather unusual incident in the spring of 1960 which apparently gave the antisatellite proponents stronger justification for their arguments. The discovery of an "unknown satellite" by US tracking facilities forced White House officials to allow the further development of an inspection variant of the US Air Force's Satellite Interceptor (SAINT) program.[16]

The work on SAINT had begun some years earlier before the unknown satellite was discovered. As early as 1956 Air Research and Development Command (ARDC) had begun a study of defensive measures against hostile satellites. In 1958 the ARPA had assumed responsibility for the task but ARDC remained as the project's supervisor. Both ARDC and ARPA as well as others had surmised that, with the rapidly advancing technology of the time, a threat in the form of Soviet "bombs in orbit" was possible in the early 1960s.

Ostensibly, that was the rationale for the requirement to develop a capability to "inspect and, if necessary, destroy any hostile satellite."[17]

Bearing the name SAINT, the program's objective was to investigate and demonstrate a satellite interception capability. In June 1961 Dr Harold Brown (later to become the Secretary of Defense under President Jimmy Carter) testified before the Senate Committee on Aeronautical and Space Sciences on the purpose of SAINT. He told the committee that SAINT was being developed "because we believe that we must have the capability to inspect any unidentified space object to determine its characteristics, capabilities or intent."[18] Brown also reported to the committee that this function "might be done with unmanned satellites capable of maneuvering to intercept unidentified spacecraft and that the results of the planned test flights would enable the Office of the Secretary of Defense (OSD) to determine the feasibility of the SAINT approach."[19]

## Terminating the Satellite Interceptor

Before many of the contracts for developing SAINTs were awarded, the program was in trouble. Financial, technical, and political problems spelled doom for the program. The Air Force's inability to solely fund SAINTs, as well as subsequent budget cuts in the program, presented insurmountable financial problems. SAINT contractors, in spite of their promises, faced a myriad of very difficult problems.[20] President Eisenhower's (and later President John F. Kennedy's) "Space for Peace" platform presented perhaps the largest obstacle SAINT had to overcome before it stood a chance for full scale development and deployment. Charles Sheldon, who attended SAINT contractor briefings at the White House, remarked SAINT suffered from "severe conceptual problems—for example: could you get away with inspecting another satellite without creating horrendous international problems?"[21] Perhaps that is what Eisenhower and Kennedy feared most—the political repercussions of "weaponizing" space. Given these difficulties the Air Force cancelled the SAINT program on 3 December 1962.

## Hedging Bets

Nevertheless, Kennedy, like Eisenhower, was apparently still willing to "hedge his bets" by authorizing the development of other ASAT programs just in case they might be needed to negate any unforeseen Soviet space threat. In February 1963, Marshal Biriuzov, chief of the Soviet Strategic Rocket Forces, stated in an interview: "It has now become possible at a command from earth to launch missiles from satellites at any desired time and at any point in the satellite trajectory."[22] Apparently the Defense Department had already anticipated such an eventuality and had determined the need to develop the

means to negate such a threat should it arise. The previous month Secretary of Defense Robert S. McNamara had testified before Congress that "the Soviet Union may now have or soon achieve the capability to place in orbit bomb-carrying satellites . . . [and] we must make the necessary preparations now to counter it if it does develop."[23] As it turns out, McNamara had instructed the US Army in May 1962 to develop an ASAT in the form of a modified Nike Zeus.[24] Perhaps as further insurance, the Air Force was directed to ready an ASAT capability in the form of a Thor missile.[25]

The legacy of providing an insurance policy, or a contingency (hedging a bet), apparently weighed heavily on the mind of the Kennedy administration, particularly so since the Russian Biriuzov's statement was made public. And how did McNamara explain the rationale behind the requirement for two ASAT systems? He said "the answer to that is that the Army system has capabilities the Air Force system doesn't have, so we consider it desirable to keep both."[26] McNamara declared that both systems achieved operational status during the summer of 1964.[27]

## Reconsidering ASAT's Need

Had the services succeeded in gaining an operational antisatellite? On first inspection that may appear to be true. However, after further examination it would appear that the policies of Eisenhower and Kennedy actually remained in tact—to pursue the peaceful use of space while, at the same time, providing for an insurance policy in the form of a contingency just in case some unforeseen threat did arise. A treaty banning weapons of mass destruction from outer space was signed in 1963—and the nation deployed two ASAT systems (both of which were actually of limited utility) in 1964. Now that weapons of mass destruction had been banned from outer space (ostensibly the threat the ASAT systems were deployed to counter), the only raison d'etre for the ASATs remained the negation of hostile satellites.[28] However, McNamara ordered the cancellation of the Army's Nike Zeus program in 1966.[29] On 4 May 1970 Deputy Secretary of Defense David Packard directed the Air Force to terminate the Thor ASAT program it had deployed on Johnston Island. According to Air Force Historian Jacob Neufeld, the rationale for cancelling the Air Force ASAT program was because the system "was effective only against satellites operating in certain orbits and its use of nuclear warheads [as its kill mechanism] created uncertainty as to when—if indeed ever—it might be used."[30]

## Summarizing the Early Days

Thus, the US ASAT program during its conception and childhood was pulled from two different directions. On one hand, the Eisenhower administration developed some seminal policies for space which held tremendous

import for any requirement to develop a capability to negate an object in space. Eisenhower anticipated the relative importance of satellites for the US versus the USSR and determined the US was better off in a world in which reconnaissance satellites operated from a sanctuary. He was unwilling to engage in an "antisatellite war" with the Soviets when such a war may prove more beneficial for them to wage than the US. Furthermore, Eisenhower's administration gave little credibility to Soviet reconnaissance satellite capabilities (perhaps a conceit over Soviet technology). After all, some staffers claimed, the Soviets could gain just as much information from open sources due to the nature of our society. Such a point further buttressed the early claims that our reconnaissance satellites were more valuable to us because of the Soviets' closed society. Therefore, we could not afford to lose such "critical capability" in a tit-for-tat ASAT war. Given this position, while acknowledging the potential necessity to develop an insurance policy (vis-á-vis ASAT, to counter any unforeseen threat), Eisenhower conceived a "two-track" policy of attempting to preserve the peaceful use of space while allowing at least conceptual development of an ASAT.

On the other hand, the military services, other defense agencies, and some members of Congress strongly voiced requirements for developing an ASAT in these early years. In spite of administration desires to prevent the weaponization of space and preserve it for peaceful purposes, the ASAT proponents deemed it necessary to develop a capability to negate any threat the Soviets may deploy in outer space, whether an orbiting bomb or a spy satellite. Despite the treaty banning weapons of mass destruction from space, Generals White and Gavin and Senator Keating anticipated another Soviet space threat (reconnaissance satellites) which would keep the arguments for and against a US ASAT program continuing, and evolving, beyond the cancellation of America's first operational ASAT programs.

**Notes**

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7. J. R. Killian, *Sputnik, Scientists, and Eisenhower* (Cambridge, Mass.: MIT Press, 1977), 297.

8. Stares, *Militarization of Space,* 47.

9. NSC 5814/1, "Preliminary U.S. Policy on Outer Space," White House Office, Office of the Special Assistant for National Security Affairs, NSC Series, Policy Papers Subseries, Eisenhower Library. Also quoted in Stares, 50.

10. James Douglas to Gordon Gray, letter, 23 May 1960, White House, Office of the Special Assistant to National Security Affairs, 1952–61, Reconnaissance Satellites, Eisenhower Library. Also quoted in Stares, 50.

11. NSC 5814/1, 8. Also in Stares, 51.

12. Stares, 51.

13. Herbert York, *Race to Oblivion* (New York: Simon and Schuster, 1970), 131.

14. From an interview conducted by Paul Stares with an unnamed source. Quoted in Stares, 52.

15. NSC 5814/1.

16. Stares, 55; G. M. Steinberg, *Satellite Reconnaissance: The Role of Informal Bargaining* (New York: Praeger Press, 1983), chap. 2.

17. Max Rosenberg, *The Air Force in Space 1959–1960* (USAF Historical Division Liaison Office, June 1962), 40–41.

18. Carl Berger, *The Air Force in Space Fiscal Year 1961* (USAF Historical Division Liaison Office, April 1966), 72. (Secret) Information extracted is unclassified).

19. Ibid.

20. Stares, 116.

21. Ibid.

22. Quoted from US Congress, Senate, Committee on Aeronautical and Space Sciences, *Soviet Space Programs 1962–1965: Goals and Purposes, Achievements, Plans and International Implications,* Staff Report (30 December 1966), 75.

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24. This statement apparently came from the transcript of a Pentagon news conference on 18 September 1964 and quoted in Stares, 76–77.

25. History of Air Defense Command, vol. 1 July–December 1964: 38.

26. Stares, 81.

27. Senate, Committee on Appropriations and Committee on Armed Services, *Department of Defense Appropriations 1966,* 89th Cong., 1st sess., 24 February 1965, 68.

28. Ibid.

29. Message 241439Z, Joint Chief of Staff, 23 May 1966, noted in Stares, 120.

30. Jacob Neufeld, *The Air Force in Space 1970–1974* (Office of Air Force History, August 1976), 42–43.

## Chapter 4

# The Sophistication of the ASAT Controversy

From the late 1960s until the early 1980s the Soviet Union tested and deployed its own antisatellite system. During this period the Soviet military space program grew dramatically. The increasing Soviet expansion into space with military space programs and ASAT systems sharpened the debate in this country over the need for an ASAT program and our own dependence on space systems. This chapter briefly discusses a possible rationale behind the Soviet's development of an antisatellite system. Understanding the Soviet rationale for its ASAT program might provide insight into the arguments provided by the US ASAT program proponents. The Carter administration's two-track policy for the revitalized US ASAT program as a response to Soviet ASAT threat is also discussed, including the administration's rationale for its policy. Finally, the maturation of the arguments for and against the US ASAT program, as it developed during the Reagan administration, is presented.

## Soviets Initiate an ASAT Program

The Soviet Union tested a co-orbital antisatellite system seven times during the period 20 October 1968 to 3 December 1971. Of these seven tests, five succeeded and two failed.[1] The Soviets had proceeded with an ASAT program when the US had canceled its Army ASAT program in 1966 and directed the cancellation of the Air Force ASAT program in 1970. Why would the Soviets proceed with an ASAT when its primary adversary had seen no need to retain its own ASAT system?

Soviet literature provided insight into the motivation behind the Soviet space program and the development of its antisatellite capability. In a March 1967 issue of the Soviet Army newspaper *Red Star*, a Lt Col L. Larionov wrote:

> The creation and employment of various space systems and apparatus can lead immediately to major strategic results. The working out of efficient means of striking from space and of combat with space weapons in combination with nuclear weapons places in the hands of the strategic leadership a new powerful means of affecting the military-economic potential and military might of the enemy.[2]

Perhaps the best indication of the Soviet motivation behind its antisatellite program is contained within its doctrinal concepts. The Soviet Union in 1965 defined "anti-space defense" and its purpose in the following way:

> The main purpose of anti-space defense is to destroy space systems used by the enemy for military purposes, in their orbits. The principal means of anti-space defense are special spacecraft and vehicles (for example, satellite interceptors), which may be controlled either from the ground or by special crews.[3]

It would appear the Soviets viewed the requirement for a satellite negation capability in much the same way that Generals White and Gavin had for a similar US ASAT program. The motivations were the same for both sides. Nevertheless, it was not until the Soviets resumed testing of their co-orbital ASAT system in 1976, after a five year hiatus, that the US revitalized its ASAT program.[4]

## Revitalizing the US ASAT—The Carter "Two-Track" Policy

The outgoing Ford administration and the incoming Carter administration recognized the Soviet "anti-space defense" system as a new threat to US space programs. In his fiscal year 1978 report to Congress, Secretary of Defense Donald H. Rumsfeld characterized a dangerous new space environment that the US would face in the future. "Space," he said, "has thus far been a relative sanctuary, but it will not remain so indefinitely. The Soviets could use their antisatellite capability during a crisis or conflict to deny us the use of a vital element in our total military system."[5] In response to this newly perceived threat the Ford administration planned to "increase significantly the US space defense effort over a broad range of space-related activities which include space surveillance, satellite systems survivability, and the related space operations control function (meaning a US ASAT)."[6] Did these statements represent a new turn in the US ASAT program's history? Was the Ford administration willing to accept eventual "weaponization of space" which the Eisenhower and Kennedy administrations strove so hard to avoid? For perhaps the first time a highly placed member of a President's administration implicitly accepted the argument that space should not be made a sanctuary. Unlike previous administrations, however, the Carter administration faced the likelihood of an early operational Soviet ASAT. Like the Eisenhower and Kennedy administrations, however, the Carter policy still favored the continuation of the two-track policy of pursuing arms control negotiations with the Soviets and preserving an insurance policy by continuing research and development of an ASAT system. One year into the Carter presidency, Secretary of Defense Harold Brown's report to Congress described the administration's policy on ASATs in a tone very much like that used by the Eisenhower and Kennedy administrations 15 years earlier. Brown reported:

> As the President has clearly stated, it would be preferable for both sides to join in on an effective, and adequately verifiable ban on anti-satellite (ASAT) systems; we

> certainly have no desire to engage in a space weapons race. However, the Soviets with their present capability are leaving us with little choice. Because of our growing dependence on space systems we can hardly permit them to have a dominant position in the ASAT realm. We hope that negotiations on ASAT limitations lead to a strong symmetric control. But in the meantime we must proceed with ASAT programs (for the present short of operational or space testing), especially since we do not know if the Soviets will accept the controls on these weapons that we would think necessary.[7]

The Carter administration thus acknowledged what the Eisenhower administration had anticipated: a growing US dependence on satellites. To deal with that dependence and maintain a sanctuary of operations for the space systems it chose the same course of action that previous administrations had chosen—ASAT arms control negotiation with a concomitant, but constrained, ASAT research and development program.

Despite the era of deténte and the successful conclusion of other arms control treaties on antiballistic missiles and strategic arms, the Soviets were unwilling to come to an agreement on ASAT limitations during this era. The Carter administration engaged the Soviets on three separate occasions from 1978 to 1979 in an attempt to come to some agreement on ASAT arms control. Carter broke off the discourse after the Soviets invaded Afghanistan in late 1979. Writing some years later, Ambassador Henry Cooper provided a possible reason for the Soviet reluctance to come to terms with the US on an ASAT treaty at the time. Cooper postulated that "the Soviets presented correct technical arguments as to why a comprehensive ASAT ban was not feasible, given the many ways in which satellites could be attacked, why such a ban could not be verified, and how it could easily be circumvented."[8]

The Carter two-track policy of attempting to maintain an arms control discourse with the Soviets while fostering an ASAT research and development program at the same time kept the US ASAT program factions reasonably satisfied for the time being. Those opposed to engaging the USSR in an ASAT arms race (mostly members of the State Department and the Arms Control and Disarmament Agency) were willing to bide their time until the Afghanistan invasion was resolved, Carter was reelected, and the Soviets returned to the negotiating table. The ASAT proponents (primarily members of the military) appeared satisfied with the ASAT research and development effort as long as progress was shown, but were probably concerned the Soviets may be nearing an operational antispace defense capability.[9]

The Carter administration's two-track policy and the continued Soviet testing of its co-orbital ASAT system generated some new, or at least evolved, arguments in the continuing debate between US ASAT proponents and opponents. The growing dependence of the US on its satellite systems, a fear of letting the Soviets gain the upper hand in an ASAT realm, and the difficulties in achieving a verifiable ban or control of ASAT systems entered the ASAT controversy as points of contention. These arguments along with others would grow and become even more contentious during the Reagan administration.

## Soviet Initiatives—And the Reagan Response

Key events early in the Reagan administration polarized the ASAT factions. First, the Soviets began a campaign to ban the stationing of weapons in space. In 1981 they submitted to the United Nations a draft ASAT treaty calling for the banning of weapons in space. Two years later Soviet Premier Yuri Andropov continued the Soviet "peace initiative" by denying Soviet first use of ASATs in outer space and offered to dismantle the existing Soviet ASAT system and prohibit any further ASAT development. In 1983 the Soviets offered another draft treaty to the UN. This treaty called for "a ban on the use of force in space and dismantlement of existing ASAT systems."[10] Coincidentally, the Soviets tested their co-orbital ASAT system for its twentieth and final test in 1982. Even though the test was a failure, the Soviets shortly thereafter declared unilaterally a moratorium on any further tests of its co-orbital ASAT.[11] The Soviets' apparent willingness to give up their ASAT capability and negotiate a ban on any further ASAT development impressed ASAT antagonists in the US. This would also be ammunition that the ASAT opponents would use later in arguing their case in Congress against development and deployment of a US ASAT. Regardless, the Reagan administration decided that the development, procurement, and deployment of a US ASAT was vital to national security interests despite the Soviet initiatives.

Reagan showed his strong support for the US ASAT (an F-15 air-launched miniature homing vehicle) in several ways. He requested additional funding for the program from Congress. Indeed, from FY 1982 through FY 1985 Congress appropriated each year what the administration requested. But most importantly, this administration provided specific guidance for the US ASAT's raison d'etre. Writing to Congress on 31 March 1984, President Reagan provided the two primary reasons for pursuing a US ASAT. First, a US capability to destroy satellites was needed to deter Soviet attacks on US satellites in a crisis or conflict. The policy statement cited, as an example, that if the Soviet Union used its ASAT capability in such a crisis or conflict to disable or destroy a US satellite, the US would have no means to respond in kind to avoid escalating the conflict.[12] Second, it was argued, "a comprehensive ASAT ban would afford a sanctuary to existing Soviet satellites designed to target U.S. naval and land conventional forces."[13] Therefore, the Reagan administration argued, a capability was needed "for US and Allied security to protect against threatening satellites."[14] The Administration's policy provided new life for the ASAT proponents. ASAT supporters now had formally codified policy for justifying the requirement for a US ASAT: a means to deter the Soviets from using their co-orbital ASAT to attack US space systems and a means to negate Soviet space systems designed to target US forces. The Soviet initiatives and the Reagan administration's ASAT policy increased the tension between the two opposing factions and focused congressional interest on ASAT as it had never been. Reagan's policy represented a departure, a

significant turning point in ASAT history, from the policies espoused by previous administrations. Reagan virtually repudiated the two-track policy of Eisenhower and Carter. Indeed, in his report to Congress he stated that "no arrangements or agreements beyond those already governing military activities in outer space have been found to date that are judged to be in the overall interest of the United States and its Allies." Concerned about an escalation of the arms race into space, ASAT opponents sought to constrain, and perhaps stop, the US ASAT program and force the administration to the bargaining table with the Soviets.

## Soviet Satellites—How Threatening Are They

In the appropriations hearings for fiscal year 1984, Congress began investigating the Administration's second requirement for an ASAT—to negate "threatening" Soviet space systems which may be used to observe or target US surface forces. Dr Cooper, Director of Defense Research Projects (DARPA), testified that "[i]t was not until the use of Soviet low earth orbiting satellites and their ocean surveillance capabilities that we began to feel those spacecraft were so threatening to our forces in their ability to [monitor and target] our large capital ships . . . that we realized we probably should have an [ASAT] capability."[15] Cooper was referring to the Soviet ELINT Ocean Reconnaissance Satellites (EORSATs) and Radar Ocean Reconnaissance Satellites (RORSATs). In his testimony he indicated it was relatively easy for the Soviets to target a carrier with these systems. On the very same day, however, Vice Adm Gordon Nagler, the Navy's Director, Command and Control, contradicted Cooper. He did not agree with Cooper's assessment that it was easy for RORSAT or EORSAT to detect a carrier fleet and stated he had discussed in previous classified testimony how the Navy handles such situations.[16]

In separate arms control hearings before Congress, another Navy Admiral testified that the Navy had already developed ways for dealing with Soviet overhead reconnaissance capabilities. Adm Noel Gayler indicated the Navy practiced the reduction of its communications and radar transmissions to avoid satellite detection. A "ship," he said, "could also jam a radar satellite or deceive it and render it ineffective."[17] It is unclear why the Navy at first appeared to attribute so little concern over the EORSAT and RORSAT threat, particularly since this was one of the prime reasons the Reagan administration used to justify the requirement for an ASAT. Since the ASAT was an Air Force program, carried and launched by an Air Force F-15, perhaps explains the Navy's less than lukewarm support of the program.

Yet another admiral supported and corroborated Nagler's and Gayler's testimonies. Congress heard additional testimony that Navy fleet dispersal patterns and ship alignments could thwart Soviet satellite detection.[18] Vice

Adm Henry Mustin related how the US Navy was able to accomplish such a feat in a 1985 North Atlantic Treaty Organization (NATO) Ocean Safari exercise:

> When we came across the Atlantic we disappeared from the face of the earth, as far as the Soviets were concerned, some place off Halifax, and only resurfaced where we are today (some 650km west of Hebrides) because we felt like it and I can tell you they were going bananas trying to find us and some of the comments they made were very interesting.[19]

Congress' Office of Technology Assessment (OTA) provided another assessment of the Soviet satellite targeting capability in a 1985 report. The office stated the Soviet EORSAT and RORSAT systems posed "only a limited threat to U.S. and allied surface fleets . . . [because] a ship would be exposed to observation only intermittently [due to the satellites' orbital configurations and observation swaths] and might successfully evade the satellite[s]."[20] OTA's report did observe that the peacetime configuration for the EORSAT and RORSAT (only one or two of each class on orbit at one time) made evading the satellites simpler, but increased numbers of the satellites on orbit launched during a crisis or conflict could make evasion a much more difficult task. OTA also allowed for the possible growing sophistication and proliferation of more satellites by both sides which might increase the incentive for the US and the USSR to maintain and deploy ASAT weapons.[21] Indeed, during the mid-1980s the Navy became more concerned with Soviet ocean reconnaissance capabilities and began voicing stronger support for the US ASAT program. Gaining stronger Navy support for the ASAT was perhaps necessary for the administration since Congress was beginning to become more resistant to the administration's ASAT plans during this period. However, the added Navy support did not offset another issue that concerned Congress. The perceived growing use and dependence on satellites, particularly by the US, proved to be another crucial complication of the ASAT controversy.

## Our Growing Dependence on Satellites

Both ASAT factions maintained that the US must safeguard the operational use of its satellites in an era where the US was becoming more dependent on satellites to support the operations of its surface forces. However, each side had its own proposals for doing that. Given the Soviet declared moratorium on any further testing of its ASAT program and its overtures in the UN to ban any weapons from outer space, the US ASAT opponents preferred constraining US ASAT development and engaging the USSR in ASAT arms control talks. Those in favor of developing the US ASAT argued the US must continue the development and deployment of its ASAT in order to deter the Soviets from using its capability to negate US space assets.

The gist of the argument in this case was the relative dependence of each side on its respective satellite programs and the perceived operational capability of the Soviet ASAT. In several congressional hearings, congressmen

and members of the US military provided views on the dependence of the US on its satellites. At these hearings, Representative Brown stated the US was greatly more dependent on its satellites than the Soviets were on their's and thus stood to lose more if both sides deployed workable ASATs. His rationale for the dependence was the global nature of our forces as opposed to the traditional continental and littoral power of the Soviet Union. He believed the Soviets were less dependent on their systems because it had land based alternatives to its satellite "$C^3$" systems and was "far less dependent on less sophisticated systems than we are on ours."[22] Representative Coughlin provided several reasons why the US was more dependent on its space programs than the Soviets were on their's and thus could not afford to engage the Soviets in a "tit-for-tat" ASAT war. "First," he said, "we had more sophisticated satellites than the Soviets and could do more with our space programs than they could with their's." (Apparently, the point he was trying to make was our space systems were more valuable to us than the Soviet space systems were to them.) Second, because our forces were much more far flung, satellite communications were necessary for our forces to operate effectively. Like Congressmen Brown, Coughlin inferred the continental (and littoral) nature of Soviet power made them less dependent on space for managing its forces than the primarily maritime nature of US forces. Third, because the USSR was a closed society, we had to rely on our satellites as a primary means of gaining useful intelligence data on the USSR. And finally, because our satellites were so reliable "we could afford to depend on them more."[23] Neither congressman addressed the issue of allowing EORSAT or RORSAT to operate with impunity. Indeed, some military members apparently agreed with the congressman. General Gabriel testified before Congress the US was better off negotiating a ban on ASATs because we needed our satellites more than the Soviets did theirs.[24] Congressman Brown quoted Vice Admiral Ramsey, a former Space Command vice commander, as saying the US was better off in an environment in which space weapons were not introduced.[25] Despite the apparent one-sidedness of the debate over satellite dependency, it was the OTA's report of 1985 which provided the best synopsis of the dilemma on this particular issue. The report stated:

> In choosing between ASAT weapon development and arms control, one wishes to pursue that course which makes the greater contribution to U.S. national security. This is often characterized as a choice between developing a capability to destroy Soviet satellites while assuming U.S. satellites will also be at risk, or protecting U.S. satellites to some extent through arms control while forfeiting effective ASAT weapons. The better choice could, in principle, be identified by comparing the utility which the United States expects to derive from its military satellites with the disutility which the United States would expect to suffer from Soviet MILSATs [military satellites] during a conflict. Such a comparison—although possible in principle—is made exceedingly difficult by the number of conflict scenarios which must be considered and by the lack of consensus or official declaration about the relative likelihood and undesirability of each scenario.[26]

Congress faced a tough dilemma. Should the nation embark on negotiations with the USSR to ban weapons in space and expect such an agreement to be

verified? On the other hand, could the nation afford to deploy an ASAT system and use it against Soviet space systems given the Soviets would use their's in response, with the Soviets perhaps having the end-game advantage due to our supposedly greater dependence on space systems? Essentially, it was a matter of which side would have more to gain or lose in an ASAT war with the Soviets. If deterrence was based on the "fear of consequences," then did we have more to fear than the Soviets if either side escalated a surface conflict to space by taking out the other side's satellites? Although it continued to hear arguments both for and against a US ASAT through the 1980s, Congress made its choice—an ASAT-free world appeared safer than one with such a weapon system.

## Congress Prevails—Constraining the US ASAT

Despite going along with the Reagan administration in its earlier years and granting appropriations for the F-15 ASAT program equal to the administration's request, Congress, in the mid-1980s began constraining the US ASAT program. For the FY 1986 appropriation procurement money was slashed significantly; in FY 1987 and 1988 Congress denied procurement money completely. On 19 December 1985 a congressional ban prohibited any further tests of US ASATs in space until and unless the Soviets tested its ASAT again. In FYs 1987 and 1988 Congress continued this ban.[27]

During the latter part of the Reagan presidency, administration officials were unable to convince Congress of any deterrent value of an ASAT or dissuade Congress that the US had more to lose than gain in an ASAT war with the Soviets. One can neither discount the possible influence on Congress by the Soviet initiative for banning weapons in space and dismantling their own ASAT system. In February 1988 Secretary of Defense Frank C. Carlucci, citing the negative impact of the congressionally mandated ASAT test bans, announced the cancellation of the Air Force's F-15 ASAT program. Now the nation was left with no means for negating threatening Soviet satellites or "deterring" Soviet use of its ASAT.

## Summarizing the Carter and Reagan Years

The Carter administration basically continued the rationale for a US ASAT used by previous administrations. The Carter two-track policy called for an ASAT research and development program while pursuing arms control negotiations with the Soviets. The Reagan administration evolved the US ASAT rationale. It repudiated the two-track policy and pursued a US ASAT more vigorously, proclaiming it was needed to deter Soviet use of its ASAT while providing a needed capability to negate hostile Soviet space systems. Congress eventually constrained the US ASAT program, citing overdepen-

dence on our space systems as motivation to reengage the Soviets on ASAT negotiation as well as some skepticism over the threat posed by Soviet space systems. Consequently, the DOD canceled the most visible US ASAT program of the 1970s and 1980s.

**Notes**

1. Nicholas Johnson, *The Soviet Year in Space 1983* (Colorado Springs: Teledyne Brown Engineering, 1984), 39.

2. "Missiles and Strategy," *Red Star* (21 March 1962), quoted in Thomas W. Wolfe, *Soviet Strategy at the Crossroads* (Cambridge, Mass.: Harvard University Press, 1964), 204–05.

3. *Dictionary of Basic Military Terms: A Soviet View,* USAF Series on Soviet Military Thought, no. 9 (Washington, D.C.: Government Printing Office, 1972): 177.

4. Note: The US may have waited because it still had some residual (but limited) capability with the Air Force Thor ASAT systems which was finally decommissioned in 1975. Furthermore, the Safeguard ABM system had an inherent, but also limited, ASAT capability until it was deactivated in 1976.

5. *Report of the Secretary of Defense Donald H. Rumsfeld to the Congress on the FY 1978 Budget, FY 1979 Authorization Request and FY 1978–1982 Defense Programs,* 17 January 1977.

6. Ibid.

7. Harold Brown, Secretary of Defense, *Department of Defense Annual Report Fiscal Year 1979,* 2 February 1978.

8. Henry F. Cooper, "Anti-satellite Systems and Arms Control: Lessons from the Past," *Strategic Review* (Spring 1989), 41.

9. The Soviets conducted 10 more tests of its co-orbital ASAT between February 1976 and April 1980 with a 30 percent success rate.

10. Marcia S. Smith, *CRS Issue Brief: ASATs—Antisatellite Weapon Systems,* Congressional Research Service (7 December 1989), 15.

11. Ibid.

12. Ronald Reagan, *US Policy on ASAT Arms Control: Communication from the President of the United States* (Washington, D.C.: Government Printing Office, 1984), 7.

13. Ibid., 8.

14. Ibid.

15. House, Committee on Appropriations, *Department of Defense Appropriations for 1984,* 98th Cong., 1st sess. (23 March 1983), pt. 8, 449–50.

16. Ibid., 464.

17. House, Subcommittee on International Security, and Scientific Affairs of the Committee on Foreign Affairs, *Arms Control in Outer Space,* 98th Cong., 2d sess. (2 May 1984), 324–26.

18. Senate, Committee on Appropriations, *Department of Defense Appropriations for 1985,* 98th Cong., 2d sess., 325.

19. Stephen Broadbent, "Protection of Convoy Routes a Key Objective for OCEAN SAFARI 85," *Jane's Defence Weekly* (5 October1985), 752.

20. Office of Technology Assessment, *Antisatellite Weapons, Countermeasures, and Arms Control: Summary* (Government Printing Office, 1985), 8.

21. Ibid.

22. House of Representatives, *The Daily Congressional Record* (Government Printing Office, 1987), H3664.

23. Ibid., H3666–67.

24. House, Committee on Appropriations, *Department of Defense Appropriations for 1985,* 98th Cong., 2d sess., pt. 2, 191.

25. House, *The Daily Congressional Record,* 28 April 1988, H2660.
26. Office of Technology Assessment, *ASAT Weapons, Countermeasures, and Arms Control,* Government Printing Office, 10.
27. Smith, 12.

## Chapter 5

# Changing Strategies

When the Reagan administration submitted its fiscal year 1990 defense budget, Secretary of Defense Carlucci included a statement asserting "that the lack of a U.S. ASAT system was the single most vulnerable point in the country's defense."[1] Given such a strong commitment to achieving an operational ASAT, the administration decided on a new bureaucratic and advocacy strategy for an ASAT program.

To give the ASAT program a better chance of service and congressional support, Reagan initiated a multifaceted program involving all three services. Unlike the solely Air Force led F-15 ASAT program, the new ASAT program was led by a Joint Program Office (JPO) with each service having a stake in the survival of the program. Perhaps this was meant to avoid some of the apparent faux pas committed in the 1980s when the Navy expressed little concern over EORSATs and RORSATs, the ostensible targets for the earlier F-15 ASAT. Apparently regretting the Navy's unenthusiastic support for ASAT in the early 1980s, Adm C. A. H. Trost wrote Congressman William M. Dickinson expressing his concern over improving and expanding Soviet space systems.[2] In the early 1980s, Trost explained, the Navy attributed only rudimentary capabilities to Soviet space systems for monitoring and surveilling US forces. Now the Navy took the threat of Soviet space systems more seriously. Bureaucratic strategy was not the only strategy change the administration was willing to try.

The DOD now emphasized the tactical role for ASATs. Previously, the DOD thought of ASATs as weapons to be used in a strategic scenario, that is, "only if a nuclear attack was underway or considered imminent, and consequently that a Soviet attack on a US satellite would be a warning signal that a nuclear attack was about to commence."[3] The new DOD position that was ASAT's principal role was in a conventional war, striking threatening satellites to prevent their observation of tactical (or perhaps operational) level maneuvers by friendly forces.[4] This position was adopted by Gen John L. Piotrowski and included in a letter to Congressman Dickinson in response to questions the congressman had on some ASAT issues.

In his letter Piotrowski addressed several important issues which had fueled the ASAT debate during the 1980s. First, Piotrowski clarified what he believed the deterrent value of an ASAT was, "We seek," Piotrowski said, "to deter a Soviet decision to go to war—particularly a conventional war."[5] This represented a departure from the past strategy of touting the need for ASAT as deterrent to Soviet ASAT strikes on our space systems. Adopting the

previous position of using ASAT as a deterrent to Soviet ASAT strikes on US space systems implied the US would prefer a verifiable ASAT-free world. The general believed the US was not better off in an ASAT-free world, even if an ASAT ban were verifiable. Such a ban, he stated, would allow threatening Soviet systems to operate in a sanctuary. That to him was unacceptable.[6] It also meant forswearing any first strikes against Soviet space systems since ASAT's role was presumably deterring like strikes on our space systems. However, advocating ASAT as a deterrent to a Soviet decision to go to war did not abdicate US ASAT first-use following a Soviet conventional attack. With this new strategy, the DOD had now broadened the deterrent role of ASAT. It was now an element for deterring war—not just enemy ASAT strikes.

Piotrowski addressed one other important point in his letter—the issue of satellite dependency. Piotrowski argued both the US and the USSR were highly dependent upon their satellites. However, he emphasized, the Soviets were particularly dependent on RORSATs, EORSATs, and other satellite systems to locate and threaten US forces. Piotrowski thus attempted to refute ASAT opponents' argument that we were more dependent on our satellites than the Soviets were on theirs. Therefore, Piotrowski implied, it would be foolish to allow such enemy capabilities to operate in a sanctuary. This was an issue Congressmen Brown and Coughlin never addressed.

The position taken by General Piotrowski represented an important modification in the advocacy strategy for an ASAT. The requirement for an ASAT was now couched in a broader deterrent role. The DOD was no longer conceding the satellite dependency issue to the ASAT opponents. Unlike General Gabriel and perhaps Vice Admiral Ramsey, a senior military spokesman no longer accepted the argument that the US was better off in an ASAT-free world. Piotrowski promoted his argument not only in letters to congressman, but presented his argument in formal hearings before Congress in order to reverse the ban on ASAT testing.[7]

In the fiscal year 1989 DOD authorization bill (H.R. 4264), Representative Brown proposed an amendment which would have extended the ban on US ASAT testing permanently. In the past such amendments had been limited to one year periods. Brown's amendment was defeated by a narrow margin. The ban on ASAT testing had lasted nearly three years. Why had Congress changed its mind to remove the congressional moratorium on testing of a US ASAT? Perhaps it was General Piotrowski's testimony before one of the House's Armed Services Subcommittees in which he explained the enormous advantages the Soviets had over the US in space.[8] Or perhaps it was the change in the bureaucratic and advocacy strategies adopted by the Reagan administration and the DOD.

Whether or not it was Piotrowski's testimony or the change in strategies, Congress did defeat the Brown amendment. And it was Representative Brown who offered some of his own thoughts as to why the legislation to extend indefinitely the moratorium on ASAT testing was defeated.

Initially, Brown offered three explanations for the defeat of the Brown-Coughlin amendment. Perhaps, he thought, some congressional members

were afraid of the "permanent nature of the testing restriction." Or perhaps some of these members "felt that passage of the amendment was not necessary, because of the cancellation of the [F-15] program." Or a third explanation was that "these members felt that it was no longer good arms control policy, since the president was now a vigorous proponent of arms control and could be depended upon to seek a reasonable ASAT arms control agreement with the Soviets, without further restrictions by the Congress."[9] Despite these reasons, Brown asserted that a strong effort by the White House, the JCS, and the Air Force helped to defeat the Brown-Coughlin amendment. At the heart of this vigorous effort, Brown stated, was a "high and rapidly increasing priority being given to the development of a war-fighting capability in space."[10]

Perhaps Brown's final assessment was correct. It would appear that Piotrowski and the DOD did indeed think ASAT was needed not just for its qualities as an element of the overall deterrent posture, but as a warfighting tool itself should deterrence fail. It could certainly be asserted, at least in the minds of the ASAT advocates, that the requirement for a US ASAT had reached adulthood. But no sooner had the US ASAT program been revitalized when the threat environment began to radically change.

**Notes**

1. Marcia S. Smith, *ASATs,* 8.
2. House, *The Daily Congressional Record,* 28 April 1988, H2664.
3. Smith, *ASATs,* 8.
4. Ibid.
5. Letter from General Piotrowski to Congressman William Dickinson, 7 July 1989.
6. Ibid.
7. Statement on space control by Gen John L. Piotrowski, USAF, commander in chief, United States Space Command. Before the Subcommittee on Research and Development, Committee on Armed Services, House of Representatives, 100th Cong., 2d sess., 10 March 1988.
8. Ibid.
9. House, *The Daily Congressional Record,* 11 May 1988, H3179.
10. Ibid., H3180.

## Chapter 6

# ASAT in a Multipolar World

## Evolving the Argument for ASAT

The demise of the Soviet Union is causing far reaching military cutbacks in the United States. Even though the US is proceeding with reductions in the defense budget and force structure, the US remains committed to protect its vital interests around the world. Consequently, the debate over the utility of a US ASAT is likely to continue in the 1990s. The rise of a multipolar world will likely see more nations gaining access to even more sophisticated and deadly weaponry. Should these nations gain access to suitable space surveillance assets, and prove adept at effectively using them, their military forces could be greatly enhanced. More nations possessing sophisticated satellite imaging capabilities, ballistic missile weaponry, and weapons of mass destruction will likely complicate US forced deployment and employment planning. A reduced US force structure when arrayed against such an enhanced threat may provide enough reason for some to demand the US develop an ASAT as a counter. Indeed, Christopher Lay believes that:

> Technical advances in space systems are reaching a point where the outcome of theater conventional conflict may be decided in favor of the side best able to control space or deny its effective use to an adversary. This ability becomes of prime importance as the United States moves toward an era of greater reliance on its ability to project forces over great distances, especially with force reductions contemplated in Europe and Asia. Longer range, highly accurate weapons also will serve to increase the requirement for effective space control and operations in a hostile environment.[1]

The space systems Lay refers to have become commonly known in today's space jargon as commercial remote sensing satellites. The debate over the development of a US ASAT in the 1990s will likely turn on the perception of whether remote sensing platforms have any warfighting potential and if they have any potential stabilizing effect on interactions of nations. Much like the arguments over ASAT in the past bipolar world, the arguments over ASAT in a multipolar world will offer familiar rationale. However, a new twist in the ASAT debate may develop. In the bipolar world, it was the introduction of ASATs by either side which generated debate over stability. In the multipolar world, some perceive it is the possession of remote-sensing platforms by multipolar nations vice ASATs which may prove destabilizing.

### Old Arguments—New Players

Gen Donald J. Kutyna, the commander of US Space Command, provides a glimpse of the impending ASAT debates of the multipolar world. Citing coalition force movements in Desert Storm, General Kutyna provided a familiar rationale, used in the bipolar era, for a US ASAT:

> During Desert Storm, the allied coalition was able to covertly reposition forces immediately before the ground combat phase began only because the Iraqis did not have an aerial surveillance capability. This move allowed General Schwarzkopf to completely surprise Iraqi ground forces and minimize allied casualties. We could not have managed this against an adversary equipped with reconnaissance satellites unless we denied the enemy the use of them. This obviously argues for an anti-satellite capability.[2]

Kutyna added that, even in an era of declining force structures, "it's not enough just to provide satellites for our use; one must acquire and maintain control of the space environment."[3] Otherwise, Kutyna concluded, the US may find itself in a situation in which it had no means to deny an enemy the capability of conducting space-supported attacks on US and friendly forces.

Kutyna's argument is similar to the one used in the 1980s by ASAT proponents. In that era, ASAT supporters argued it was the Soviet EORSAT and RORSAT capabilities which provided the greatest threat to US and allied forces. Consequently, an ASAT was needed then to deny the Soviets the use of those assets for "conducting space-supported attacks on U.S. and friendly forces." In a multipolar world, the ASAT debate will turn on a similar issue: whether an ASAT is needed to deny other nations the means for conducting space-supported attacks on US and friendly forces. To frame the ASAT debate of the 1990s, one must first consider who the new players are—and what proliferating technology in remote-sensing platforms may or may not be giving them.

## The Players—Emerging Space Powers

To date France, the People's Republic of China (PRC), India, Japan, the (former) Soviet Union, and the United States have launched and operated earth remote-sensing platforms. Five other nations or groups, including Argentina, Brazil in collaboration with the PRC, Canada, Israel, and the 15 member European Space Agency, are planning remote-sensing platforms.[4] France has reported it plans to launch a military reconnaissance satellite, designated Helios, in collaboration with Spain and Italy. Canada and Sweden reputedly have also studied the potential "launch of verification satellites."[5] Presumedly, Helios and the satellites anticipated by Canada and Sweden would be designed for purely reconnaissance purposes. At issue for this paper, and the ASAT debate, is whether the remote sensing platforms provide any warfighting potential for the owners and users.

Commercial satellites have proven they can detect and identify certain types of military activity. Periodically the DOD's *Soviet Military Power* publishes photos of Soviet military facilities and forces which have been taken by commercial satellites. Some of the photos are impressive, but one must bear in mind that there are limits to the intelligence which can be extracted from current remote-sensing satellites. For example, Pierre Bescond, the President of satellite poor l'observation de la terre (SPOT) Image, remarked that SPOT is incapable of detecting tanks.[6] The detection of tanks may be an important piece of information for an intelligence agency that is attempting to monitor the size and deployment of a prospective enemy's forces. Nevertheless, commercial satellite photos such as those which are published in *Soviet Military Power* may still prove useful in developing an intelligence data base on an enemy. In wartime, however, such photos would prove more useful if they can detect and identify in real time to a commander the size and location of enemy forces. If detection of tanks, for example, is impossible and near real time detection and identification of enemy forces is unlikely, such limitations would make remote-sensing from commercial satellites less effective for military purposes.

## The Limitations of Today's Commercial Satellites

Spatial and spectral resolution and revisit frequency determine the military usefulness of an earth remote-sensing satellite. Although spatial resolution is the most important capability a satellite must possess for intelligence purposes, spectral resolution and revisit frequency also affect a satellite's usefulness in performing intelligence functions.[7] The greater the spectral resolution capabilities a satellite possesses, the more detail it can discern and the less likely photo interpreters are to be fooled by enemy camouflage measures. If a remote-sensing satellite uses a "family" of wavebands to detect data (e.g., visible detection with radar imaging, such as Japan's JERS-1 satellite), that satellite may prove even more effective at performing intelligence collecting functions. For example, if it cannot image a target at night due to lack of visible light, it may use its radar to image the object, thereby making it more of a "round-the clock" system.

Naturally, a higher revisit frequency allows more frequent observations of a target area. The more frequent the observations, then the more likely photo interpreters will detect changes over time, such as the movement of forces.[8] During crisis or wartime situations, a military commander is likely to require frequent observations of mobile targets. Because of orbital constraints, a single, low-earth orbiting, remote-sensing satellite is not likely to provide frequent enough imaging for a commander for such targets.

As Jeffrey Richelson reminds us, a "crucial question with respect to commercial space systems is that of what trained military interpreters are able to see using the imagery."[9] Indeed, SPOT, with its 10 meter resolution capability

can detect some military classes of targets. However, the number of targets it can detect are few in number—some surface ships and surfaced submarines, and railroad yards.[10] The ability of commercial satellites to detect individual vehicles is uncertain. Even though SPOT is unable to detect tanks, commercial satellites may still prove useful in detecting military targets despite their current limitations. Well trained photo interpreters with access to computer enhancement, collateral intelligence information, and perhaps other enhancement tools may extract significant information from images. Such a synergistic system may allow the military target to be identified with a higher probability, thus providing the necessary identification and location of the target to allow destruction.

How effectively a nation or group of nations is able to derive useful military data from commercial satellite-provided images in a timely manner will undoubtedly be important in the 1990's ASAT debate. Each side is likely to make point and counterpoint on the resolution capabilities of the satellites in question—how often they "revisit" a spot on the earth, and how well-equipped the satellite is for discerning data in different wavebands of the electromagnetic spectrum. The debate is likely to become even more interesting as both sides consider the emerging trends in commercial satellites and the capabilities (or limitations) of the systems in the future.

## The Emerging Trends

Although the number of countries possessing earth remote sensing satellites is few, the ground stations servicing the satellites are more numerous and far-flung. EOSAT, the agency which operates Landsat for the US, manages Landsat ground stations in 16 countries. SPOT operates ground stations in 11 locations around the world in 10 different countries and plans six more ground stations in six other countries.

Of the countries which possess unclassified remote sensing platforms, France, India, the (former) Soviet Union and the US have sold or expressed interest in selling imagery to third parties.[11] Some third parties may not wait on a provider nation to satisfy its remote-sensing (or military reconnaissance) needs. Argentine Senator Jose Genoud, pointing to the alleged satellite support the US gave to Britain during the Falklands War, urged his country to construct and launch its own remote-sensing satellite system. Israeli Cabinet Minister Mordechai Gur complained the US was less than forthcoming in providing adequate satellite photo data during the Yom Kippur War. In September 1988 Israel launched its own photo reconnaissance satellite.[12] Fearful of the military implications of Israel's military satellite, Arab states have expressed concern over the Israeli capabilities.[13] One Arab nation, Iraq, hinted at developing an antisatellite capability to counter the Israeli satellite rather than developing a remote sensing (photo reconnaissance) satellite of its own.[14]

Historically, commercial remote sensing satellites operated in the visible and infrared bands. Satellites operating in the visible bands were restricted to

**Table 1**

**Landsat and SPOT Ground Stations**

| LANDSAT | SPOT |
|---|---|
| Argentina,Australia, Brazil, PRC, Ecuador, India, Italy, Japan, Pakistan, Canary Islands, Saudi Arabia, South Africa, Sweden, Thailand, and the US Indonesia.* | Brazil, Canada, Canary Islands, France, India, Japan, Pakistan, Saudi Arabia, South Africa, Sweden, and Thailand. Ecuador,* Israel,* the PRC,* Taiwan,* Indonesia,* Australia.* |

*Planned or under negotiation.

**Source:** Mary Umberger, "Commercial Observation Satellite Capabilities," in *Commercial Observation Satellites and International Security*,ed. Michael Krepon, et al. (New York: Saint Martin's Press, 1990), 11.

operating in daylight conditions while satellites operating with infrared detectors were hampered by bad weather. On 30 March 1991, the Soviet Union launched the first remote-sensing platform which operates with radar. Announced by the Soviets as an earth resources imaging platform, the Almaz-1 could be used to image through clouds and in daylight or nighttime conditions. Having a resolution estimated in the 15–30 meter range, its resolution capability is slightly less than that of SPOT with its 10-meter resolution capability. Yet Almaz-1 could penetrate clouds, water cover, and darkness—SPOT could not.[15] *Aviation Week & Space Technology* reported the Soviet satellite may even have the capability to detect submerged submarines.[16] If its resolution capabilities were superior to that of *SPOT*, as the *Aviation Week* article implies, Almaz-1 might prove more useful for military purposes than SPOT.

Almaz-1 uses Synthetic Aperture Radar (SAR) to perform its imaging mission. Indeed, if properly equipped, a SAR imaging satellite can provide superior resolution making the platform very valuable for a military reconnaissance mission.[17] The European Space Agency (ESA), Japan, and Canada are planning advanced SAR remote-sensing satellites for launch in the early 1990s. The Soviets have already announced its intention to sell the services of the Almaz-1 commercially. One would expect that the ESA, Japan, and Canada might do likewise with their SAR equipped satellites.

Even though trends might indicate that more nations potentially stand to gain from the proliferation of remote-sensing satellites, the satellites alone do not make a military effective system. Satellites alone represent only a piece to the puzzle of satellite image processing.

## Technology Does Not a System Make

Few nations have so far developed completely indigenous military or commercial space systems. Space systems themselves include inter alia the satellite, data processing facilities, launch sites, launcher and satellite pro-

duction facilities. Jeffrey Richelson concludes that a nation, before embarking on developing its own military or commercial space system must consider

> [t]he potential drawbacks of building a national system [which] would include absolute cost and cost efficiency. A several-billion-dollar investment would be required to establish a launch site, build the launch vehicles, develop the satellite, construct a ground control station or network, purchase the necessary computers and imagery enhancement software, and maintain a sufficiently large set of trained imagery interpreters. Additionally, it would probably be considered highly desirable, if not mandatory, to invest resources to ensure secure transmission of the data—especially given the large number of nations that operate ground stations for the interception of satellite communications.[18]

If a nation did consider the absolute cost to be affordable, it may yet determine such an intelligence gathering capability ineffective. For example, if Israel had acquired a dedicated military space system just to provide information for Entebbe-like raids, many would consider such a multibillion dollar investment foolish if other less costly intelligence gathering services could have proven just as effective.[19] However, a nation may decide it can gain satellite imaging at a more cost effective rate by entering into a client relationship with a nation that has expended the investment to develop a complete space system.

EOSAT and the SPOT organization currently operate on a contractual basis with nations operating ground stations for these programs. By sharing in construction and operating costs and paying a yearly fee, a nation operating a ground station in support of Landsat and SPOT may have access to the data provided by the satellites. Such an arrangement proves to be less costly than shouldering alone the costs for developing a commercial space system.[20]

However, there are drawbacks to such relationships. In order to take advantage of this arrangement, the station-providing nations may have to develop their own photo-interpreters. Indeed, many are doing just that. One analyst reports that remote-sensing skills are taught in several educational institutions in the US and Western Europe. These institutions offer training to foreign students. The International Space University in Boston enrolled 80 foreign students in its 1988 program.[21] But for a nation without any means for accessing a satellite (e.g., possessing no Landsat or SPOT ground station), an intelligence-sharing relationship may be arranged to satisfy the nation's satellite imagery requirements. However, such an arrangement does have drawbacks.

Depending on another nation for satellite imagery makes the client subject to the providing nation's willingness to provide the imagery or information derived from the imagery. The donor nation may provide only "bits and pieces" of data or limit the clarity of the provided image. Furthermore, depending on a donor nation to receive, process, and transmit the data may induce an extra time element in the processing and transmission of the image or information. Imagery provided in less than "near-real-time" in a crisis situation could prove useless to the client nation.

Evidently, space systems are more than just a constellation of satellites. They also include ground station equipment for servicing the satellite, data processing equipment, software, and photo interpreters. For a nation "to go it

alone," an even more robust system including launch sites, developmental facilities for launchers and satellites, and an array of tracking equipment are necessary to field a space system. Should a nation decide to obtain its satellite imagery requirements through contractual means, it may avoid a great deal of costs, but at the expense of its independence.

## Negating Reconnaissance Systems

Whether the US decides to develop an ASAT for the environment of a multipolar space world will most likely hinge on how legitimate the US perceives the threat from proliferating space systems. For argument's sake, let us suppose the US has determined that the proliferation of space technology represents a legitimate threat to US interests and the employment of US and friendly forces in the future. Consequently, the US seriously considers acquiring an ASAT for use during a crisis or wartime situation in this new world. Again the ASAT debate is likely to reflect many of the same concerns from the bipolar era. As we consider this scenario, let us look at two separate cases—a nation with its own indigenous space surveillance capability and a nation operating as a client for its satellite imagery needs.

In the first case, the objective of negating a nation's "surveillance" assets would be a logical and desirable goal for the US in a contingency operation. Like the bipolar era, however, negating space systems which provide a surveillance capability presents a dilemma for the US. In a crisis, the US has the choice of destructively negating the enemy's satellite before actual hostilities begin and risking premature escalation of the conflict, or to delay and risk the possibility of its forces being discovered by the enemy and destroyed. A less destructive negation (e.g., jamming, spoofing, avoiding detection) of the enemy's space system in this situation may prove less escalatory and may minimize any widening of the conflict. It might also mitigate the tension generated in deciding whether to attack or not, if a destructive kill mechanism is the negation instrument. Indeed, the enemy may risk a preemptive strike against US forces if it perceives its intelligence source—its space systems—are at risk of destruction.[22]

This debate is indeed similar to one used in days when the US and USSR vied. It raises the argument over a proper tactical doctrine for using an ASAT. Congressman Brown criticized the military in a similar argument when he said the Joint Chiefs of Staff "had no current tactical doctrine for using the ASAT."[23] Brown implied the military, even if it had an ASAT, had not clearly thought about how and under what circumstances it would use the weapon.

As an example, let us consider the scenario General Kutyna posed for Desert Storm in which Iraq operated a "commercial" remote-sensing satellite system with perhaps one or two satellites possessing adequate resolution for some military applications. Determining if and when the Iraqi space system should have been "negated" would have been a difficult problem for the

coalition forces. Several questions come to mind. Should the space system have been negated during Desert Shield to prevent Iraq from detecting and identifying coalition force sizes and positions? If so, at what point during Desert Shield should the system have been negated? Diplomatic negotiations and maneuvering were occurring constantly during Desert Shield, and it is doubtful the coalition would have deliberately attacked Iraq's space systems during negotiations. Therefore, Iraq would have enjoyed unrestricted freedom to monitor and target all coalition fixed forces with its one or two satellites throughout Desert Shield. Coupled with such targeting data, deadlier Scud warheads may have proven disastrous for coalition forces.

Would it still make sense not to negate them at the inception or anytime during Desert Storm? Logically, the military commanders would seek to deny Iraq any surveillance of coalition force movements. Several options present themselves as choices for the allies once hostilities have begun. One, an ASAT attack on the satellites might prove effective. Two, jamming, spoofing, deception, or avoiding detection might prove equally effective. Third, destroying Iraq's ground station facilities would also be another option which would render Iraq's overhead imagery useless. Choosing the most effective negation option is the dilemma. Unfortunately, choosing the criteria will not prove easy. Such criteria might include costs in terms of timeliness of negation, lethality, collateral damage, and weapon system expense, and perhaps others. Whatever the choice in this case, preventing an enemy from obtaining its space surveillance data from a donor may prove even more perplexing. As an example, let us change General Kutyna's scenario somewhat.

In this case Iraq has no indigenous space surveillance capability but has contracted with a third party, say the SPOT corporation of France, for its satellite imagery needs. To complicate the scenario let us also suppose France remained neutral in the conflict. It is improbable any coalition force would choose to negate a neutral's space system before hostilities have begun. If such an action was deemed necessary, it would be an extremely difficult decision for a President. Even after hostilities have begun between the adversaries, destroying a neutral's satellite or attacking his ground stations would undoubtedly still require a policy decision of the most extreme difficulty. More than likely, diplomacy would be given every chance to persuade the neutral to not fulfill any contractual requirements it may have with the enemy. Indeed, such an incident did occur in World War II when allies bought up ball bearings from a neutral, Sweden, to prevent their delivery to a belligerent, Germany, who had contracted for them. Such a "negation" is less destructive, just as effective, and probably less escalatory than an attack on a neutral's sovereign territory.

The ASAT debate in the 1990s will undoubtedly revisit this same issue—if, when, and how an ASAT should be used against the surveillance assets of another nation. Many will consider other means more effective for negating enemy nations' space systems. How legitimate a threat the space system poses for US forces may prove to be the determining factor on what means the US chooses to negate the threat.

## Stability, Proliferation, and ASAT

Many considered the introduction of a sophisticated ASAT by the US in the 1980s as potentially destabilizing and might result in a US-USSR space arms race. With the apparent end to the cold war and the perception that the restraining controls and assistance (funding, weapons) of the superpowers over their respective "blocs" are waning, some feel that low-intensity conflicts may increase. As one nation may seek to gain an advantage over its adversaries through fielding space systems, the adversaries will likely feel inspired to "keep up" by doing the same. If an aggressive nation obtains any perceived advantage over its neighbors, it may choose to act precipitously, thereby decreasing stability within the region. Nations fearing attack from such an aggressive neighbor may attempt to redress the perceived imbalance by seeking a means to eliminate the other side's advantage. In the long term the implication is that one or more nations may deem the acquisition of an ASAT necessary. If any of these nations becomes overly reliant on space systems for its intelligence needs, stability in the region could become even more threatened. Such a state may consider a preemptive strike against a neighbor if it feels its primary source of intelligence is threatened.[24] In a world devolving into such an environment, the US may again consider an ASAT as a counter to the possibility another nation may acquire one.

## Summarizing ASAT in a Multipolar World

The bipolar superpowers were the preeminent space-faring nations during the cold war. As the world becomes more multipolar, arguments for and against a US ASAT will likely consider the legitimacy of the threat the US is likely to face from the relatively embryonic space systems of any emerging space-faring nations. This element of the debate would be similar to the debate in which ASAT proponents and opponents argued the merits of whether Soviet EORSATs and RORSATs were threatening.

The impact on regional stability from the force-multiplying effect of commercial remote sensing platforms is likely to be considered for the ASAT debate, too. However, a difference exists in the stability argument in the bipolar versus multipolar era. In the bipolar world, the ASAT debate considered the impact on stability by the introduction of ASATs. In the multipolar era, the ASAT debate may consider the impact on regional stability from the potential military applications of commercial remote-sensing satellites by aggressive nations. It is in this environment that the US will have to decide its ASAT policy for the near term.

### Notes

1. Christopher D. Lay, "Space Control Predominates as Multipolar Access Grows," *Signal,* June 1990, 77.

2. Gen Donald J. Kutyna, "The Military Space Program and Desert Storm," *Space Times,* September–October 1991, 5.

3. Ibid.

4. Mary Umberger, "Commercial Observation Satellite Capabilities," in *Commercial Observation Satellites and International Security,* ed. Michael Krepon, et al. (New York: St. Martin's Press, 1990), 9. See appendix 2 of this document for more information on the satellites operated by these nations.

5. Ibid.

6. Jeffrey T. Richelson, "Implications for Nations Without Space-Based Intelligence-Collection Capabilities," ibid., 72.

7. Spatial resolution characterizes one aspect of remote-sensing data collection. Generally, the better the spatial resolution, the sharper the image and the smaller the object the sensor can detect (e.g., a 1m resolution sensor provides sharper images and can detect smaller objects than a 10m resolution sensor. Spectral resolution allows the sensor to sample the imaged object in different spectral intervals. For example, a sensor that can sample in multiple spectral intervals within the infrared wavelengths would have an advantage over a sensor than can sample in only one infrared wavelength. Revisit frequency determines how periodically the sensor passes over the same imaged area of the earth. If an area of the earth is imaged only once every 2–3 days, then activity might be missed in the area when the sensor is not overhead.

8. Umberger, 10. See appendix 2 of this report for data on resolutions, repeat cycles, and frequencies of current and near-term satellite systems.

9. Richelson, 59.

10. See appendix 1 of this report for table on Ground Resolution Requirements for Interpretation of Imagery.

11. "Space Commerce, an Industry Assessment," United States Department of Commerce, May 1988, 63–65. See also Umberger, "Commercial Observation Satellite Capabilities,"10.

12. Umberger, 13.

13. "Arab States/Israeli Satellite," United Press International (UPI), 21 September 1988, reprinted in *Current News,* 22 September 1988, 3.

14. Maj Gen Hussein Makki Khammas, cited in David B. Ottaway, "Iraq Reports Successful Test of Antitactical Ballistic Missile," *Washington Post,* A4. See also Umberger, 13–14.

15. Ronald D. Humble, "Military Implications of the Soviet *Almaz* Radar Satellite Series," *Jane's Intelligence Review,* August 1991, 376–79.

16. Craig Covault, "Soviet Radar Satellite Shows Potential to Detect Submarines," *Aviation Week & Space Technology,* 8 October 1990, 22–23.

17. Humble, 378.

18. Richelson, 64.

19. Ibid.

20. Umberger, 12.

21. Ibid.

22. A similar argument was offered in the bipolar era. See Paul B. Stares, *Space and National Security* (Washington, D.C.: Brookings Institution, 1987), 131.

23. House, *The Daily Congressional Record,* 19 May 1987, H3669.

24. These thoughts were derived from Nancy Pearson-Mackie, "Need to Know: The Proliferation of Space-Based Surveillance," *Arms Control,* (May 1991), 94–122.

## Chapter 7

# US Antisatellite
## *Whither Now?*

Whether to pursue the continued development of a US ASAT in the 1990s will prove a difficult choice for defense planners. Making a case for ASAT in the past may have seemed "intuitively obvious" to those in favor of the weapon system. The US was faced with a formidable foe possessing weapons in superior numbers in many categories. That the Soviet Union also recognized the "force-multiplier" effect space systems had for its forces made the Soviet Union appear an even more formidable enemy. Pursuing a US ASAT in that era appeared to many a logical, necessary choice to negate such advantages. In response to the perceived threat, the Eisenhower, Kennedy, and Carter administrations chose a "two-track" policy for the US ASAT program—arms control and ASAT research and development short of actual deployment. The Reagan and Bush administrations chose a different policy, opting for outright deployment convinced that verifiable arms controls on ASATs were not achievable. Fearing an escalation of the arms race to space, Congress in large part had thwarted the plans of these administrations with ASAT testing bans and reduced funding.

It remains to be seen if the ASAT advocates can make a case for ASAT in the evolving multipolar world. The Soviet Union can no longer be portrayed as formidable a threat as in the past, and no other nation for the near term seems to possess the means to destroy the US. And, no other nation in the near term will possess as impressive a space infrastructure as the Soviet Union possessed. However, as other nations do obtain more sophisticated weapon systems, including ballistic missile technology, nuclear weapons, and perhaps access to satellite imagery, the US must consider what, if any, its response should be to counter such capabilities if US interests are jeopardized. Planners should consider several issues in determining if ASAT has a future role in national security strategy.

First, who are the expected possessors of "military-capable" space systems technologies, particularly those technologies useful for monitoring and targeting surface forces? A number of the anticipated owners of commercial remote-sensing technology, which may be capable of military applications, have been allies of the US for sometime. Some have even been enemies. Predicting who will be friend or foe in the future is difficult. Nevertheless, planning the US defense structure usually begins with an assessment of who the potential enemies are likely to be.

Second, how legitimate a threat does the opposing space system present? Those opposed to ASAT may find rationale for an ASAT specious if the enemy possesses a single satellite with gross resolution capabilities, a single ground station, and inexperienced personnel. However, as the enemy's space system becomes more robust and sophisticated with several satellites possessing improved resolution, frequent satellite revisit periods, and dispersed and/or more survivable ground stations, arguments for an ASAT may become more convincing.

Whether that robustness comes from a consortium of nations pooling resources or a single nation's initiative to develop its own space infrastructure may also provide an additional consideration for the coming ASAT debate. Negating the space threat from a consortium of nations may prove more politically and militarily troublesome than with a single nation. For example, if only one nation within the consortium is the belligerent, an attack upon the space system may be viewed by other members of the consortium as an attack upon their sovereign territory also. Consider the ramifications of such an attack during Desert Storm if Iraq was a member of an Arab-sat consortium. The tenuous coalition of forces forged by the president may have been weakened by such an action. US military planners should consider such possibilities as they develop their case for ASAT in the 1990s.

Third, will the possession of space systems or access to satellite imagery make potentially aggressive nations more likely to destabilize regions important to US interests? This would prove difficult to assess but nevertheless deserves attention. Several international security analysts are already considering such possibilities. Satellite imagery may be used by some nations to tip the "cost-benefit analysis" scale in favor of aggression against a neighbor. On the other hand, if the neighbor possesses similar imaging capabilities, it may detect the buildup of enemy forces on its borders and take the necessary political and military actions to perhaps defuse the situation. However, should there be an asymmetry in imaging capabilities the buildup of enemy forces may go undetected until it is too late.

Finally, are other means available to the US besides an ASAT for negating hostile space systems should the need arise? Space systems do consist of more than just satellites in orbit. Attacking the ground systems which service the satellites may prove an effective means for denying an enemy any force-multiplying effect he expected from his space systems. Indeed this may prove an effective option if the enemy operates his space systems from a single ground station. However, a dispersed and proliferated ground control and processing system may prove more difficult to negate than one or two orbiting satellites.

Forecasting the need for a US ASAT in the future will not be easy. The debate over ASAT's future will likely reconsider some of the same arguments offered in the past. Given the changes that have occurred in the geopolitical arena over the past three years, it is even more likely that the debates may become even more difficult, particularly for ASAT proponents. However, ASAT proponents now have the recent experience of the use of space systems

in war to build their case. As General Kutyna and others pointedly argued—space systems will become more important for US forces as well as other nations. Logically, one would assume the means to negate such systems will also become more important.

As administration and military planners consider policy and doctrine for ASAT in the uncertain multipolar world environment, reflecting on ASAT's past may provide insight for charting the future defense policy for any US ASAT.

First, let us consider Eisenhower's approach when faced with the new space frontier. The US and the USSR were the only space powers of the era and each was an adversary of the other. Each was probably uncertain of just how important space might eventually become. Despite the USSR's enmity towards the US, Eisenhower apparently appreciated the uncertainty of the time and chose a flexible ASAT policy—constrained ASAT research and development and arms control negotiations.

Kennedy, like his predecessor, adopted a dual-track space defense policy for ASATs. In light of significant treaties banning weapons of mass destruction in outer space, the Kennedy administration perhaps hoped for continued negotiations which might preserve the peaceful use of space. Nevertheless, Kennedy and McNamara retained a rudimentary ASAT weapon system in the form of the nuclear-tipped Army Nike-Zeus and Air Force Thor programs in case an unforeseen Soviet space threat developed.

In an era of the SALT I treaty and detente, the Nixon administration canceled the nation's only operational ASAT. However, President Gerald R. Ford reinitiated a US ASAT program just as his administration ended. Adopting the Ford administration's ASAT program and the policies developed under Eisenhower and Kennedy, the Carter administration maintained a flexible ASAT policy. However, no rudimentary ASAT capability was retained. Carter's two-track policy considered the uncertainty of whether ASAT negotiations with the Soviets might reach a successful conclusion. In case they did not, Carter was willing to deploy an ASAT as a deterrent to the evolving Soviet ASAT capability.

The Reagan administration rejected the two-track policy, believing a verifiable ASAT arms control treaty was unachievable. Reagan chose, instead, to deploy an ASAT—fielded as a deterrent to Soviet strikes on US space systems and as a war-fighting system for negating Soviet space systems should hostilities commence. Although Soviet space systems had been growing during the tenures of previous American presidents, Soviet space systems had become even more proliferated during the Reagan years. While still acknowledging the Soviet ASAT threat, Reagan administration officials began to emphasize more the threat from Soviet space systems which might target US and allied forces. No longer did an administration believe negotiations could bring an end to the ASAT threat. But possibly more importantly, there was a belief that other space systems, considered benign during peace, could and would be used to support attacks on US forces during a crisis or war.

The relative certainty of the Soviet threat the Reagan administration came to "enjoy" is past—anticipating tomorrow's space threats no longer seems so

certain. A dramatically and continually changing world as we have recently witnessed makes those threats even harder to predict and grand national strategy harder to develop. As we saw in the past, uncertainty over the developing geopolitical arena and its future threats caused US leaders to hedge their bets. The developing space threat may seem difficult to anticipate, particularly so when one considers how advanced weapon systems are proliferating. Logic dictates we cannot afford weapons to counter every conceivable threat. But closely monitoring technology proliferation and military exports may give insight into other nations' political intentions.

During an era when defense forces and expenditures are expected to decline, the US will be forced to hedge its bets. But the two-track policy proposed for ASAT in the future must be different from the past's two-track policies. Pursuing negotiations with emerging space-faring nations for the control of ASATs is irrelevant. Unlike the former Soviet Union, none of these nations are apparently developing an ASAT. Therefore, that element of previous two-track policies is unsuitable for an ASAT policy for the multipolar world. The Reagan policy of deploying an ASAT as a deterrent to ASAT attacks on our space systems is currently irrelevant for the multipolar world. Again, that element of a previous two-track policy is unsuitable for the multipolar world because none of the emerging space-faring nations presently possesses an ASAT.

However, one element from previous two-track policies makes sense for today's ASAT policy—maintaining a strong ASAT research and development program. Indeed Secretary of Defense Dick Cheney's new defense strategy would strongly support this proposition. Testifying before the US Senate in early 1991, Mr Cheney offered a DOD-wide acquisition approach markedly different from the past:

> This will be a decade of development more than of production. Scaling back production helps us to preserve our technological superiority through ambitious research and development, procure high-priority systems at more efficient rates and lay the foundation for sustaining U.S. military strength through the year 2000 and beyond.[1]

Perhaps in support of this policy, Cheney reported to Congress that he had reduced ASAT acquisition funding in the DOD fiscal year 1992 budget.[2]

Collective security should be the other element for the 1990s' ASAT two-track policy. Albeit a broader interpretation of a past two-track policy element—negotiations—collective security makes sense for the US ASAT policy in the developing multipolar world. In the past, negotiations served to control the feared escalation of the arms race into space, vis-á-vis anti-satellites. In the multipolar world's future, the US is not as likely to be faced with an ASAT arms race with another country. Instead, it is the potential force-multiplying effect an enemy nation may enjoy when it integrates its embryonic, but growing, space systems with its modernizing forces that worries the US. However, Secretary of Defense Cheney expects collective security (to remain) central to US strategy "as a means for contribut[ing] to a cooperative world order."[3] As an important facet of collective security, Cheney

added, "arms control should be used to reduce military threats and inject predictability and stability into international relationships."[4] Such a policy in this case would pursue negotiations with space-faring nations to prevent dissemination of valuable space systems data to belligerent nations in time of crisis or war. Furthermore, this policy would seek to control the spread of sophisticated space systems technology to aggressive nations who might attempt to develop their own space systems.

Why should this policy seem acceptable for the US for the present? Considering the number of nations who are currently projected to operate commercial remote-sensing satellites and the expected capabilities of those satellites, the US can afford to forego deploying its current ASAT program—for now. The numbers of those nations are few. And as we have previously discussed, the remote-sensing space systems they possess may not have the adequate characteristics to present a formidable threat. Should these nations become hostile and show tendencies for increasing the size and capabilities of their space systems, the US in turn could consider development and production of an ASAT system. The collective security track (with its commensurate emphasis on arms control) should prove acceptable to US ASAT proponents and opponents alike. An effective collective security pact, which denies the use of space-derived data to a belligerent, would practically satisfy the military's concern for leaving space as a sanctuary for enemy operations. Furthermore, this proposed ASAT policy element would be consistent with President Bush's "new world order"—by electing to defer ASAT production and deployment the Bush administration would be perceived positively by the world community as seriously pursuing international collective security.

The geopolitical climate has changed from the cold war and so has the threat. Consequently, the US has already begun to reduce its forces in recognition of this fact. Congress continues to press the administration and the DOD for further reductions. As the US shapes its defensive forces for the 1990s amid reduced defense spending and force structure reductions, it cannot afford to deploy every weapon system proposed. On the other hand, neither can it afford to be surprised by a continually changing, evolving threat environment. Deciding what the right policy should be for tomorrow's weapon system always entails risks. In an era in which the threat appears diminished, albeit somewhat more uncertain, the proposed ASAT policy makes sense and minimizes risks. Just like hedging our bets in the past, hedging our bets in the future will prove effective in supporting our national security interests.

**Notes**

1. Dick Cheney, "A Recipe for Lean, High-Quality Forces," *Defense 91,* March/April 1991,15.
2. House, Committee on Appropriations, *Department of Defense Appropriations for 1992,* 102d Cong., 1st sess., 19 February 1991, pt. 1, 11.
3. Ibid., 5.
4. Ibid., 21.

## Appendix 1

## Ground Resolution Requirements for Interpretation of Imagery

| Target[a] | Detection[b] | General ID[c] | Precise ID*d* | Description[e] | Tech Analysis[f] |
|---|---|---|---|---|---|
| Bridges | 6 | 4.5 | 1.5 | 1 | 0.3 |
| Communications | | | | | |
| Radar | 3 | 1 | 0.3 | 0.15 | 0.015 |
| Radio | 3 | 1.5 | 0.3 | 0.15 | 0.015 |
| Supply dumps | 1.5-3 | 0.6 | 0.3 | 0.03 | 0.03 |
| Troops units (in bivouac or on road) | 6 | 2 | 1.2 | 0.3 | 0.15 |
| Airfield facilities | 6 | 4.5 | 3 | 0.3 | 0.15 |
| Rockets/artillery | 1 | 0.6 | 0.15 | 0.05 | 0.045 |
| Aircraft | 4.5 | 1.5 | 1 | 0.15 | 0.045 |
| Command and Control Headquarters | 3 | 1.5 | 1 | 0.15 | 0.09 |
| Missile Sites (SSM/SAM) | 3 | 1.5 | 0.6 | 0.3 | 0.045 |
| Surface ships | 7.5-15 | 4.5 | 0.6 | 0.3 | 0.045 |
| Nuclear weapons components | 2.5 | 1.5 | 0.3 | 0.03 | 0.015 |
| Vehicles | | 0.6 | 0.3 | 0.06 | 0.045 |
| Land mines | 3-9 | 6 | 1 | 0.03 | 0.09 |
| Ports/Harbors | 30 | 15 | 6 | 3 | 0.3 |
| Coasts, landing beaches | 15-30 | 4.5 | 3 | 1.5 | 0.15 |
| Railroad yards and shops | 15-30 | 15 | 6 | 1.5 | 0.4 |
| Roads | 6-9 | 6 | 1.8 | 0.6 | 0.4 |
| Urban areas | 60 | 30 | 3 | 3 | 0.75 |
| Terrain | | 90 | 4.5 | 1.5 | 0.75 |
| Surfaced subs | 7.5-30 | 4.5-6 | 1.5 | 1 | 0.03 |

[a]Chart indicates minimum resolution in meters at which target can be detected, identified, described, or analyzed. No source specifies which definition of resolution (pixel-size or white-dot) is used, but the chart is internally consistent.

[b]Detection: location of a class of units, object or activity of military unit.

[c]General identification: determination of general target type.

[d]Precise identification: discrimination within target type of known types.

[e]Description: size/dimension, configuration/layout, component construction, equipment count, etc.

[f]Technical analysis: detailed analysis of specific equipment.

**Source:** Ann M. Florini, "The Opening Skies: Third Party Imaging Satellites and U.S. Security," *International Security* vol. 13, no. 2, 91–123.

## Appendix 2

## Projected Commercial Observation Satellites

| Country/ Satellite | Launch Date | Resolution (meters) | Revisit Cycle (days) | Channels |
|---|---|---|---|---|
| Canada/Radarsat | 1992 | 15–30 | 3 | 1 |
| European Space Agency/ERS-1 (w/follow-ons) | 1989 | 25–30 | 3 | 1 |
| France/SPOT | 1986 | 10–20 | 2.5 (midlatitudes) | 4 |
| India/IRS-1 (w/follow-ons) | 1987 | 36–72 | 22 | 4 |
| Janap/MOS-1 (w/follow-ons) | 1987 | 50 | 17 | 4 |
| Japan/JERS-1 | 1991 | 25 | not available | 7 & radar |
| Soviet Union/ "RESOURCE" (KFA-1000) | early 1980s | 6 | 14 | 2 |
| USA/Landsat 4, 5 | 1982, 1984 | 30–120 | 16 | 7 |
| USA/Landsat 6 | 1991 | 15–120 | 16 | 8 |

**Source:** Mary Umberger, "Commercial Observation Satellite Capabilities," in *Commercial Observation Satellites and International Security,* ed. Michael Krepon, et al. (New York: St. Martin's Press, 1990), 11.

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